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10/029,101	12/20/2001	Richard L. Woodin	XDEV1140	8517

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EXAMINER

DIAZ, JOSE R

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 08/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/029,101

Applicant(s)

WOODIN ET AL.

Examiner

José R Díaz

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 July 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claims 11 and 23-24 are objected to because of the following informalities:
 - With regards to claim 11, the recitation of "The process of claim 7, wherein: the claim 7, wherein:" should be changed to --The process of claim 7, wherein: --.
 - With regards to claims 23-24, please note that claim 24 is included in claim 23. Please separate both claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 7, 12, 19, 22, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Ogino et al. (US Pat. No. 5,502,003).

Regarding claims 7, 12, 19, 22 and 28, Ogino et al. teaches a process for forming an electrical connection comprising the steps of: forming a first metal-containing layer (Ni/W) over a silicon carbide (SiC) (see Fig. 7), and annealing the first metal-containing layer (Ni/W) and the silicon carbide (SiC) a temperature

less than the melting point of the metal-containing layer or more than 300 °C for at least 10 hours (see col. 3, lines 46-53).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 7-8, 10-12, 14-16, 19, 20-22, 24-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sano (JP 59-214224 A).

Regarding claims 7, 19 and 28, Sano teaches a process for forming an electrical connection comprising the steps of: forming a first metal-containing layer (aluminum/Si) over a silicon carbide (SiC) (see Constitution), and annealing

the first metal-containing layer (aluminum/Si) and the silicon carbide (SiC) a temperature less than the melting point of the metal-containing layer (please consider the fact that the melting point of Si is higher than 950 °C) or more than 300 °C (see Constitution). With regards to the claimed limitation of annealing for at least 10 hours, Sano provides a general teaching of annealing for a period longer than 5 min (see last three lines of Constitution). Therefore, it would have been obvious to one of ordinary skill in the art to vary the time period of the annealing process, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Huang*, 40 USPQ2d 1685,1688(Fed. Cir. 1996) citing *In re Aller*, 105 USPQ 233., 235 (CCPA 1955).

Regarding claim 8, Sano teaches that the metal-containing layer comprises aluminum.

Regarding claims 10-11 and 20-21, Sano teaches that the composition of the metal containing layer is approximately 90% aluminum or substantially pure aluminum (see first sentence or line 5 of Constitution).

Regarding claims 12 and 22, Sano is silent with respect to the claimed time range. However, Sano provides a general teaching of annealing for a period longer than 5 min (see last three lines of Constitution). Therefore, it would have been obvious to one of ordinary skill in the art to vary the time period of the annealing process, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges

Art Unit: 2815

involves only routine skill in the art. *In re Huang*, 40 USPQ2d 1685,1688(Fed. Cir. 1996) citing *In re Aller*, 105 USPQ 233., 235 (CCPA 1955).

Regarding claims 14 and 24, Sano teaches forming an alloy with the SiC and the metal containing layer (see third sentence in Constitution)

Regarding claims 15 and 25, Sano teaches that the exposed region is a p-type doped (see first three lines of Constitution).

Regarding claims 16 and 26, Sano teaches that the annealing is performed in a vacuum (see second sentence of Constitution).

6. Claims 7, 9, 12-13, 15, 17-19, 22-23, 25, and 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bartch et al. (US Pat. No. 6,468,890 B2).

Regarding claims 7, 19 and 28, Bartch et al. teaches a process for forming an electrical connection comprising the steps of: forming a first metal-containing layer (110) over a silicon carbide (100) (see Fig. 1), and annealing the first metal-containing layer (110) and the silicon carbide (100) a temperature less than the melting point of the metal-containing layer or more than 300 °C (see col. 5, lines 55-57 and col. 6, lines 49-67). With regards to the claimed limitation of annealing for at least 10 hours, Bartch et al. provides a general teaching of annealing for several hours (see col. 6, lines 57-58). Therefore, it would have been obvious to one of ordinary skill in the art to vary the time period of the annealing process, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine

Art Unit: 2815

skill in the art. *In re Huang*, 40 USPQ2d 1685,1688(Fed. Cir. 1996) citing *In re Aller*, 105 USPQ 233., 235 (CCPA 1955).

Regarding claims 9, 12-13 and 22-23, Bartch et al. is silent with respect to the claimed temperature and time ranges. However, Bartch et al. provides a general teaching of annealing at lower temperature for several hours (see col. 6, lines 49-59). Therefore, it would have been obvious to one of ordinary skill in the art to vary the time period and the temperature of the annealing process, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Huang*, 40 USPQ2d 1685,1688(Fed. Cir. 1996) citing *In re Aller*, 105 USPQ 233., 235 (CCPA 1955).

Regarding claims 15 and 25, Bartch et al. teaches that the exposed region is p-type doped (see col. 7, lines 49-52).

Regarding claims 17 and 27, Bartch et al. teaches that the annealing is performed using a noble gas (see col.7, lines 5-8).

Regarding claim 18, Bartch et al. teaches the further steps of removing a portion of the first metal containing layer (110) and forming a second metal (130) over the contact region (1400 (see Fig. 1).

Response to Arguments

7. Applicant's arguments, see pages 1-3 of remarks, filed July 21, 2003, with respect to claims 7-28 have been fully considered and are persuasive. The Final rejection of claims 7-28 has been withdrawn.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following reference teaches the formation of an ohmic contact: Tischler (US Pat. No. 5,980,265), see examples 1 and 2 in columns 10-12; Toda et al. (US Pat. No. 5,668,382), see figures 2-6; Baliga et al. (US Pat. No. 5,635,412), see col. 5, lines 55-64; Zekentes et al. (US Pat. No. 6,599,644 B1), see abstract and claim 1; Mito et al. (US Pat. No. 5,070,027), see abstract and Fig. 2; Friedrichs et al. (US 2002/0125482 A1), see abstract and paragraph [0054]; Slater, JR. (US 2002/0179910 A1), paragraph [0049]; Casady et al. (US Pat. No. 2003/0034495 A1), see abstract; Sano et al. (JP 01-020616 A), see Constitution); A. E. Nomura et al., "Ohmic Contact Formation on N-Type 6H-SiC Using polysilicon and Silicides", Semiconductor Device Research Symposium, 2001 International, 5-7 Dec. 2001, Page(s): 523 -526; and D. Alok et al., "Low contact resistivity ohmic contacts to 6H-silicon carbide", Electron Devices Meeting, 1993. Technical Digest., International , 5-8 Dec. 1993, Page(s): 691 -694.

Art Unit: 2815

Correspondence

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 9:00-5:00 Monday, Tuesday, Thursday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 746-3891 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD
July 30, 2003


GEORGE ECKERT
PRIMARY EXAMINER